International Journal of Innovative Computing, Information and Control
Volume **3**, Number **1**, February **2007**

ICIC International ©2007 ISSN 1349-4198
pp. **199–209**

PERFORMANCE MODEL FOR MANUFACTURING FACILITY PLANNING BASED ON SYSTEM CONFIGURATION, RAM AND LCC

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Received July 2006; revised October 2006

Abstract. *This paper focuses on developing performance model for manufacturing facility design considering systems configuration, RAM design and the system life cycle cost. For this study, we used a four-step approach. The major steps involved in this procedure are: 1) deal with initial system configurations to meet the required production rate, 2) develop system reliability, availability and maintainability, RAM model, 3) present a system life cycle costing model considering system configuration and system RAM, and 4) propose a simulation model to find the optimal system to meet the production requirement by considering system configuration, system RAM, and life cycle cost. Finally, we developed a computer program to facilitate computations for the proposed model and its test results have been presented based on computations using this software. The developed model can be used to analyze system performance evaluation for both design and operational phases. Furthermore, this research can be extended easily for various problems solving with a variety form of outputs.*
Keywords: Facility planning, Performance evaluation, RAM, LCC, Simulation

1. **Introduction.** In this research, we developed a performance evaluation model for manufacturing system which uses a step-by-step comparative approach considering the systems performance factors such as: system configuration, system reliability, availability and maintainability (RAM), life cycle cost (LCC), and system optimization. In practice, in order to get the entire production system into its operational state after a failure, we have to repair or replace all the machines. In this case the operating cost incurs for repair or replacement depending in part on the system availability. In this paper, we use the system availability and life cycle cost to evaluate diverse flexible manufacturing system designs [20] and also choose an optimal system according to a measure of effectiveness such as system configuration, cost, production rate and availability [9,11,13]. We have proposed a four-step generative approach as: 1) in the first step, we developed an initial system configuration based on system performance without considering system RAM (system availability = 1) and life cycle cost. In this step, the buffer capacity of each facility is assumed to be unlimited. 2) In the second step, we developed system RAM model to consider the system availability. We developed two-state RAM and multi-state RAM model and compared these effects in system performance. Truly, a reliability management program should be concerned itself with how to improve the system reliability from its birth-to-death process and its test [16]. Considering the occurrence of any failures